

AMENDMENTS TO THE CLAIMS

Following is a listing of all claims in the present application, which listing supersedes all previously presented claims:

Listing of Claims:

1-16. (Canceled).

17. (Currently Amended) A fuel cell having a membrane-electrode assembly, the membrane-electrode assembly being fabricated by a method, the method comprising:

coating ~~nano-sized~~ catalytic metal particles on a proton exchange polymer membrane by sputtering a catalytic metal source;

coating ~~nano-sized~~ carbon particles on the proton exchange polymer membrane by arc discharging or by sputtering a carbon source to form a nanophase catalyst layer; and

bonding electrodes to the proton exchange polymer membrane having the nanophase catalyst layer.

18. (Previously Presented) The fuel cell as claimed in claim 17, wherein the catalytic metal source is pure platinum (Pt), an alloy or a mixture of Pt and at least one metal selected from the group consisting of gold (Au), palladium (Pd), rhodium (Rh), iridium (Ir), ruthenium (Ru), tin (Sn), and molybdenum (Mo); and the carbon source is selected from the group consisting of graphite and carbon rod.

19. (Previously Presented) The fuel cell as claimed in claim 17, wherein the catalyst layer has a thickness of 10-100 nm, and the coated catalytic metal and carbon particles have a particle size of 2-10 nm.

20. (Previously Presented) The fuel cell as claimed in claim 17, wherein the amount of the catalytic metal loading per electrode area is in the range of 0.01-0.2 mg/cm² for a proton exchange membrane fuel cell, and is in the range of 0.1-2 mg/cm² for a direct methanol fuel cell.

21. (Previously Presented) The fuel cell as claimed in claim 17, wherein the amount of the catalytic metal coated is in the range of 20-85% by weight based on the total weight of the catalytic metal and the carbon particles.

22. (Previously Presented) The fuel cell as claimed in claim 17, wherein sputtering the catalytic metal source or the carbon source is carried out at a gas pressure of 10-1,000 Pa with a power of 100-400 W.

23. (Previously Presented) The fuel cell as claimed in claim 17, wherein the arc discharging is carried out at a gas pressure of 10-1,000 Pa and a discharge current of 100A or less.

24. (Currently Amended) A fuel cell having a membrane-electrode assembly, the membrane-electrode assembly being fabricated by a method, the method comprising:

coating ~~nano-sized~~ catalytic metal and ~~nano-sized~~ carbon particles on a proton exchange polymer membrane by simultaneously sputtering a catalytic metal source and a carbon source to form a nanophase catalyst layer; and

bonding electrodes to the proton exchange polymer membrane having the catalyst layer.

25. (Previously Presented) The fuel cell as claimed in claim 24, wherein the catalytic metal source is pure platinum (Pt), an alloy or a mixture of Pt and at least one metal selected from the group consisting of gold (Au), palladium (Pd), rhodium (Rh), iridium (Ir), ruthenium (Ru), tin (Sn), and molybdenum (Mo); and the carbon source is selected from the group consisting of graphite and carbon rod.

26. (Previously Presented) The fuel cell as claimed in claim 24, wherein the catalyst layer has a thickness of 10-100 nm, and the coated catalytic metal and carbon particles have a particle size of 2-10 nm.

27. (Previously Presented) The fuel cell as claimed in claim 24, wherein the amount of the catalytic metal loading per electrode area is in the range of 0.01-0.2 mg/cm² for a proton exchange membrane fuel cell, and is in the range of 0.1-2 mg/cm² for a direct methanol fuel cell.

28. (Previously Presented) The fuel cell as claimed in claim 24, wherein the amount of the catalytic metal coated is in the range of 20-85% by weight based on the total weight of the catalytic metal and the carbon particles.

29. (Previously Presented) The fuel cell as claimed in claim 24, wherein sputtering the catalytic metal source or the carbon source is carried out at a gas pressure of 10-1,000 Pa with a power of 100-400 W.

30. (Previously Presented) The fuel cell as claimed in claim 24, wherein the arc discharging is carried out at a gas pressure of 10-1,000 Pa and a discharge current of 100A or less.